Section VIII

BENCH CHECK PROCEDURES

LOCALIZER RECEIVER BENCH CHECK
AJAX MODEL 16-L

The localizer receiver bench check will be performed by a radio repairman, or a qualified technician working under his supervision. The standards and procedures contained in RTCA Paper 23-63/DO-117, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers," dated March 4, 1963, will be used to perform the tests and adjustments specified in pars. 4 thru 7 below.

1. Remove the dust cover and thoroughly inspect the receiver for cleanliness, chafed wires, leaking components, bulging resistors, impending parts failure, and need for lubrication, repair, or replacement of parts.

2. Perform any cleaning operations necessary, using an air jet of clean, dry, compressed air and a small, soft-bristled brush. Use solvent and a brush where necessary to remove dirt deposits. Do not use excessive air pressure or solvents that will damage any receiver components.

3. Check cable receptacles for dirty or broken connector sockets. Repair or replace as necessary.

4. Check the deviation indicator centering by applying a 1000 microvolt standard localizer centering signal and adjusting the centering/balance control of the receiver to produce an on-course indication or zero indicator deflection.

5. Check the indicator deflection sensitivity by applying a 1000 microvolt standard localizer deviation signal and adjusting the course sensitivity control of the receiver to produce standard deflection (90 microamperes) plus/minus 5% on the deviation indicator. Any error should be balanced between the 90 cps and 150 cps sectors.

6. Check the flag alarm by alternately applying a standard localizer test signal of 3 mv (rated receiver sensitivity) and 20,000 mv, and adjust the receiver alarm circuitry to produce a flag alarm current of 375 plus/minus 5 microamperes. Determine that the alarm flag is in the "out of sight" position. The adjustments made to meet this requirement shall provide the following additional alarm performance automatically without further readjustments:

   The alarm flag shall be plainly visible:

   a. With the loss of either modulation signal from the rf test signal,

   b. With the complete loss of rf input signal,

   c. When both modulation signals are decreased by 50% of standard value.

7. Check the audio output for minimum level of 100 milliwatts into a 600 ohm load with 5 microvolts input modulated 30% with a 1000 cps audio signal.

8. Upon completion of the adjustments made in paragraphs 4 through 7, above, check the receiver performance on at least three other channels. If further adjustment is necessary due to interaction of controls or other causes, repeat the adjustment procedures as necessary to obtain the required performance on all channels checked.

9. Re-install the dust cover and touch up any damage to the finish.

10. Enter the date, name and certificate number of the repair facility that performed the bench check in the maintenance record of the localizer receiver. This completes the bench check.

11. Re-install the receiver in the airplane and perform the inspection of the localizer receiving system required in the schedule of inspections. Enter the date, name of the person performing the inspection, whether technician or pilot, indicate satisfactory or unsatisfactory performance, in the maintenance record of the localizer receiver.

WORK CHECK SHEET FOR LOCALIZER RECEIVER
AJAX MODEL 16-L

This sheet will be completed for each bench check of the localizer receiver and filed in the airplane maintenance records.

Receiver serial number _____. ☐

1. Visually inspect receiver and chassis. ☐
2. Clean, lubricate, replace parts as necessary. ☐
3. Check cable receptacles. Clean or replace as required. ☐
4. Adjust deviation indicator centering/balance. ☐
5. Adjust deflection sensitivity. ☐
6. Adjust flag alarm circuitry. ☐
7. Check audio output for a minimum level of 100 mw. ☐
8. Other channels checked _____mc, _____mc, _____mc. ☐
9. Re-install dust cover, touch-up paint. ☐
10. Make entry in localizer receiver maintenance record. ☐
11. Re-install receiver in airplane and perform inspection. ☐

Date _____

By _____

Repair Station Name & Cert. No. _____

GLIDE SLOPE RECEIVER BENCH CHECK
AJAX MODEL 22-G

The glide slope receiver check will be performed by a radio repairman or a qualified technician working under his supervision.

The standards and procedures contained in RTCA Paper 23-63/DO-117, dated March 14, 1963, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers," will be used to perform the tests and adjustments specified in paragraphs 3 through 6 below with the exception of item 4. It is necessary to increase receiver deflection sensitivity to meet Category II approach performance requirements.

1. Remove the dust cover and thoroughly inspect the receiver for cleanliness, chafed wires, leaking components, bulging resistors, impending parts failure, and need for lubrication, repair, or replacement of parts.

2. Perform any cleaning operations necessary, using an air jet of clean, dry, compressed air and a small, soft-bristled brush. Use solvent and a brush where necessary to remove dirt deposits. Do not use excessive air pressure or solvents that will damage any receiver components.

3. Check the deviation indicator centering by applying a 700 microvolt standard glide slope centering signal and adjusting the centering/balance control of the receiver to produce an on-course indication or zero indicator deflection.

4. Check the deviation indicator deflection sensitivity by applying a 500 microvolt standard glide slope deviation signal and adjusting the course sensitivity control of the receiver to produce standard deflection (78 microamperes) plus/minus 5% on the deviation indicator.

5. This receiver is equipped with course softening. Apply a standard glide slope deviation signal of 14,000 microvolts and adjust the course softening control on the receiver to produce standard deflection plus/minus 5% on the deviation indicator.

6. Check the flag alarm by alternately applying a standard glide slope test signal of 20 microvolts (rated receiver sensitivity) and 20,000 microvolts, and adjust the alarm circuitry to produce a flag alarm current of 375 plus/minus 5 microamperes. Determine that the flag alarm is in the "out of sight" position. The adjustments made to meet this requirement shall provide the following additional flag alarm performance automatically without further readjustments:

   The flag alarm shall be plainly visible or in the alarm condition:

   a. With the loss of either modulation signal from the rf signal,

b. With the complete loss of rf input signal,

c. When both modulation signals are decreased by 50% of standard value.

7. Upon completion of the adjustments required in paragraphs 3 through 6, check the receiver performance on at least three other channels. If further adjustment is necessary due to interaction of controls or other causes, repeat the adjustment procedures as necessary to obtain the stated performance requirements.

8. Re-install the dust cover and touch up any damage to the finish.

9. Enter the date, name and certificate number of the repair facility that performed the bench check in the maintenance record of the glide slope receiver. This completes the bench check.

10. Re-install the receiver in the airplane and perform the inspection of the glide slope receiving system required in the schedule of inspections. Enter the date, name of the person performing the inspection, whether technician or pilot, and indicate satisfactory or unsatisfactory performance in the maintenance record of the glide slope receiver.

MARKER RECEIVER BENCH CHECK
VOLE MODEL AV-21

The marker receiver bench check will be performed by a radio repairman, or a qualified technician working under his supervision.

The inspection and bench check will be performed using the following procedures and referring to the VOLE AV-21 maintenance manual No. 334-21 where necessary:

1. Remove the dust cover and thoroughly inspect the receiver for cleanliness, chafed wires, leaking components, bulging resistors, impending parts failure, and need for lubrication, repair, or replacement of parts.

2. Perform any cleaning operations necessary, using an air jet of clean, dry, compressed air and a small, soft-bristled brush. Use solvent and a brush where necessary to remove dirt deposits. Do not use excessive air pressure or solvents that will damage any receiver components.

3. Adjust the receiver sensitivity by setting the "High-Low" switch to "Low" and applying a 2800 microvolt 75 mc test signal modulated 90% at a frequency of 1300 cps to the receiver. Measure the voltage across the amber indicators on the test panel. It should be 3.3 volts. If this value is not indicated, consult the manufacturer's maintenance manual for adjustment procedures.

4. Check the indicator lamp selectivity by applying a 200,000 microvolt 75 mc test signal modulated 90% at frequencies of 400 cps, 1300 cps, and 3000 cps, with the "High-Low" switch set to "High". Determine that the blue indicator light illuminates when 400 cps is applied; the amber light when 1300 cps is applied; and, the white light when 3000 cps is applied. The lamp that illuminates should have at least 4.5 volts applied to it, and the other two no more than 1.0 volt impressed across them as measured by an AC VTVM.

5. Perform checks to determine the following:

   a. Audio output is at least 100 milliwatts, at 400, 1300, 3000 cps modulation within a signal input range of 20,000 to 200,000 microvolts and the "High-Low" switch set to "Low".

   b. Audio noise is more than 50 db below 100 milliwatts in the absence of an rf signal and a signal-plus-noise to noise ratio of at least 20 db over an input signal level range of 200 to 20,000 microvolts with the "High-Low" switch set to "Low".

6. Re-install the dust cover and touch up any damage to the finish.

7. Enter the date, name and certificate number of the repair facility that performed the bench check in the maintenance record of the marker receiver. This completes the bench check.

8. Re-install the receiver in the airplane and perform the inspection of the marker receiving system required in the schedule of inspections. Enter the date, name of the person performing the inspection, whether technician or pilot, and indicate satisfactory or unsatisfactory performance in the maintenance record of the marker receiver.

ENGINEERING EQUIPMENT INSTALLATION APPROVAL
CRITERIA AND ACCEPTABLE MEANS OF COMPLIANCE - CATEGORY II
AIRBORNE NAVIGATION, INSTRUMENT AND FLIGHT CONTROL SYSTEMS

1. EQUIPMENT APPROVAL CRITERIA - GENERAL. Subject to a satisfactory engineering approved inspection and test program, airborne navigation instrument and/or flight control equipment may be eligible for installation approval as part of an installed system when it is:

   a. Found to comply with the requirements of an applicable technical standard order or type certificate, or

   b. Found to comply with applicable Federal Aviation Regulations and approved as part of an airplane under a type certificate or supplemental type certificate, or

   c. Found to comply with other pertinent specifications adopted by the FAA Administrator; e.g., military standards or a foreign government's validation which has been found to be compatible with the intent of the appropriate Federal Aviation Regulations.

2. INSPECTION AND TEST PROGRAM.

   a. This engineering program involves first an agreement between the applicant and the appropriate FAA Engineering and Manufacturing Regional or District Office which identifies the individual or combined systems proposed as a Category II installation. After a design and ground test evaluation, a type inspection authorization or similar document is usually issued which will specify those additional conformity, ground and flight inspections considered necessary. Also included in the program will be a determination of satisfactory installation practices, freedom from interference, performance of intended functions and compatibility with ground navigation facilities and the Air Traffic Control System.

   b. System Performance Requirement. For the combination of systems to provide the level of accuracy, reliability and compatibility needed to assure an approach capability which is considered acceptable to the FAA Administrator, each individual system should be found to perform its intended function in accordance with the following:

      (1) Data Display. All displays of information essential for the use of the flight crew in a Category II installation should incorporate such positioning, marking and lighting as will permit accurate and timely utilization of such information and recognition of malfunctions by pilots of average skill and reaction time.

(2) Control Functions. All systems which furnish signals directly to the airplane flight control system or the propulsion thrust control system should be so designed that if malfunction occurs, such malfunction does not result in an unsafe condition. Means for quick disengaging or overriding of each automatic control function should be immediately available and easily accessible to the flight crew without requiring the crew to apply excessive control forces.

c. Function and Reliability Testing. In addition to the engineering inspection and test program, a program of function and reliability testing may be required for the purpose of supplementing analytical and test data, such as fault analysis and reliability studies, with accelerated service experience. The extent of the additional tests depends upon the complexity, number, nature of (or novel) design features incorporated in system and the record of previous tests and experience. Additional tests should be predicated on:

(1) The extent of flight and ground time utilized during the developmental and type certification program and difficulties associated therewith.

(2) The service history of the device/systems when this device has been utilized on airplanes previously approved.

3. ACCEPTABLE MEANS OF COMPLIANCE FOR CATEGORY II INSTALLATION OF AIRBORNE NAVIGATION, INSTRUMENT AND FLIGHT CONTROL SYSTEMS. The minimum performance standards applicable to systems which are to be used as a part of a Category II system shall be applied to the following:

a. Localizer. The localizer system installation should comply with the following:

(1) The localizer equipment should meet or exceed minimum performance standards set forth in Federal Aviation Agency Technical Standard Order C36b, dated June 15, 1962, "Minimum Performance Standards for Airborne ILS Localizer Receiving Equipment," or applicable type certificate, or RTCA Paper 20-63/DO-115, dated February 14, 1963, "Minimum Performance Standards - Airborne ILS Localizer Receiving Equipment."

(2) The localizer system installation should meet or exceed the minimum performance standards set forth in RTCA Paper 69-60/DO-102, dated April 12, 1960, "Minimum In-Flight Performance Standards - ILS Localizer Receiving Equipment."

(3) Display to the pilot positive visual indication to show degradation of localizer system performance under the following conditions:

(a) The absence of either or both modulation signals.

(b) The reduction of either or both modulation signals to one-half the normal 20%.

(c) When a difference of depth of modulation equal to 0.093 $\pm$ 0.002 produces an output of less than one-half normal response to this standard localizer deviation signal.

(4) The localizer receiving centering error should be within 5 ua on a 95% probability basis under the following conditions, using a standard test signal:

(a) Variation of R.F. signal level from 50 to 1000 uv.

NOTE: This represents the variation of R.F. signal level expected during the final phase of an ILS approach.

(b) Variation of DC power over the range of 24 to 28 volts or AC power over the range of 105 to 120 volts.

(c) Variation of ambient temperature over the limited range expected during a normal ILS approach. The nominal ambient temperature range is defined as +10°C. to +40°C. Operation over a different temperature range in a particular airplane will require special coordination.

(5) The localizer receiving equipment should be adjusted in accordance with RTCA Paper 23-63/DO-117, dated March 14, 1963, "Standard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers."

b. Glide Slope. The glide slope system installation should comply with the following:

(1) The glide slope equipment should meet or exceed the minimum performance standards set forth in Federal Aviation Agency, Technical Standard Order C34b, dated May 9, 1963, "Minimum Performance Standards for Airborne ILS Glide Slope Receiving Equipment," or applicable type certification, or RTCA Paper 21-63/DO-116, dated February 14, 1963, "Minimum Performance Standards - Airborne ILS Glide Slope Receiving Equipment."

(2) The glide slope system installation should meet or exceed the minimum performance standards set forth in RTCA Paper 233-59/DO-101, dated December 8, 1959, "Minimum In-Flight Performance Standards ILS Glide Slope Receiving Equipment."

(3) Display of the pilot positive visual indication to show degradation of glide slope system performance under the following conditions:

(a) The absence of either or both modulation signals.

(b) The reduction of either or both modulation signals to one-half of their normal 40%.

(c) When a difference of depth of modulation equal to 0.091± .002 produces an output of less than one-half normal response to this standard glide slope deviation signal.

(4) Centering Error. The glide slope centering requirements outlined in RTCA Paper 222-58/DO-89 are applicable for Category II installation approval.

(5) The glide slope receiving equipment should be adjusted in accordance with RTCA Paper 23-63/DO-117, dated March 14, 1963, "Standdard Adjustment Criteria for Airborne Localizer and Glide Slope Receivers."

c. Automatic Pilot/Coupler. When an automatic pilot/coupler system is used as part of Category II installation, it should, in addition to complying with applicable TSO and FARs, provide the following performance under the test conditions stated:

(1) Airplane Speed - Maximum and minimum operational approach speeds.

(2) Wind Conditions - Surface downwind component of 10 knots. Wind shear of 4 knots per 100 feet altitude applied along the runway or across the runway individually, commencing at an altitude of 500 feet. The effects may be shown analytically, or correlated with some Flight Test data.

(3) Localizer Performance -

(a) The airplane should be stabilized on the localizer for the purpose of demonstration before the outer marker is intercepted on a normal inbound approach.

(b) From the outer marker to an altitude of 300 feet above runway elevation on the approach path, the automatic pilot/coupler should cause the airplane to track automatically to within ± 35 microamperes (95% probability) of the indicated localizer course. The performance should be free to sustained oscillations.

(c) From an altitude 300 feet above runway elevation on the approach path to the decision altitude (100 feet), the automatic pilot/coupler should cause the airplane to track automatically to within $\pm$ 25 microamperes (95% probability) of the indicated course. The performance should be free of sustained oscillations.

(4) Glide Slope Performance -

(a) For the purposes of the demonstration, the airplane should be stabilized on the glide slope before an altitude of 700 feet above the field level is reached.

(b) From 700 feet altitude to the decision altitude, the autopilot/coupler without manual assistance should cause the airplane to track the center of the indicated glide slope to within $\pm$ 35 microamperes or $\pm$ 12 feet, whichever is the larger, without sustained oscillations. When the pilot is in the loop providing manual assistance, $\pm$ 75 microamperes tracking tolerance may be used.

d. Flight Director Systems. When a flight director system is used as part of a Category II installation, it should provide for the following performance under the test conditions stated:

(1) Airplane Speed - Maximum and Minimum operational approach speeds.

(2) Wind Conditions - Surface crosswind component of 15 knots. Surface downwind component of 10 knots. Wind sheer of 4 knots per 100 feet altitude applied along the runway or across the runway individually, commencing at an altitude of 500 feet. The effects may be shown analytically if correlated with some flight test data.

(3) Mode selection and Indication -

(a) Manual Selection should be positive, and the selection should be clearly identified.

(b) When the mode of operation is not shown by the manual mode selector and by the command display behavior, means should be employed to clearly annunciate the existing mode.

(4) Localizer Performance -

(a) The airplane should be stabilized on the localizer for the purpose of demonstration before the outer marker is intercepted on a normal inbound approach.

(b) From the outer marker to an altitude of 300 feet above runway elevation on the approach path, the flight director should permit the pilot to track within ± 35 microamperes (95% probability) of the indicated localizer course. The performance should be free of sustained oscillations.

(c) From an altitude 300 feet above runway elevation on the approach path to the decision altitude (100 feet), the flight director should permit the pilot to track to within ± 25 microamperes (95% probability) of the indicated course. The performance should be free of sustained oscillations.

(5) Glide Slope Performance -

(a) For the purposes of the demonstration, the airplane should be stabilized on the glide slope before an altitude of 700 feet above the field level is reached.

(b) From 700 feet altitude to the decision altitude (100 feet) the flight director should permit the pilot to track the center of the indicated glide slope to within ± 75 microamperes or ± 22 feet, whichever is the larger, without sustained oscillations.

e. Automatic Throttle System.

(1) An automatic throttle system, if used, should provide safe operation under conditions which can reasonably be expected in normal service, including wind sheer, gusts and sideslips. The system should:

(a) Automatically adjust throttles to maintain airplane speed to within ± 5 knots of stabilized programmed airspeed, but not less than computed threshold airspeed under all intended flight conditions. Proper operating points such as reference speed or angle of attack may be set manually or automatically.

(b) Provide throttle application at a rate consistent with the recommendations of the appropriate engine and airframe manufacturers.

(c) Maintain stable short period and phugoid airplane modes for all intended flight situations during manual and automatic flight control.

(2) Malfunction of any part of the system should not restrict either pilot from maintaining safe control of the airplane or engines.

(a) Disconnect switch(es) readily accessible to both pilot and second in command should be provided.

(b) The throttle drive mechanism should be designed to permit manual overriding without application of excessive throttle forces.

(c) The maximum servo velocity attainable should be positively limited by design to that required for adequate performance.

(d) Appropriate indication of system engagement and disengagement should be provided.

f. Aircraft Configuration Change. The aircraft should be stabilized on the approach in the landing configuration and no late stage configuration change should be permitted.

g. Rain Removal Capability. Rain removal equipment should be provided to assure adequate visibility for transition, landing and roll-out under assumed Category II weather conditions.

h. Other Automatic Devices. Yaw dampers, rudder bias devices, and other designs that are part of the original airplane airworthiness or part of the CAT II system should not cause adverse interaction of integrated components during normal or malfunction operation of the devices. The sudden failure of the critical engine, on the approach, should be considered in this evaluation.

i. Approved Airplane Flight Manual or Markings or Placards. Upon satisfactory completion of an engineering inspection and test program, the FAA airplane flight manual or supplement thereto, or markings or placards should reflect the following:

(1) The limitations, if any.

(2) Revision to the performance section, if appropriate.

(3) A statement of CAT II approval to the effect that, "The airborne instruments and equipment meet the performance standards of Attachment 2 of this AC _____ dated _____."

NOTE: Compliance with the performance standards referenced above, does not constitute approval to conduct Category II operations.

CATEGORY II APPROACH EVALUATION

Pilot in Command_____ Second in Command _____ Date_____
Registration No._____ Airport_____ Runway_____ Weather_____ Wind_____
FAA Inspector:_____

This form will be completed whenever an approach is attempted utilizing the airborne low approach system, regardless of whether the approach is abandoned or concluded successfully.

APPROACH EVALUATION:

1. Was the approach successful? YES /__/ NO /__/

2. Flight control guidance system used

   a. Auto-coupler /__/
   b. Flight director /__/
   c. If equipped and used, did a. and b. agree? YES /__/ NO /__/

   Second in Command? YES /__/ NO /__/
   FAA Inspector? YES /__/ NO /__/

3. Airspeed at middle marker ± ____ at 100' ± _____ from programmed speed?

4. If unable to initiate /__/ or complete /__/ approach (indicate which), was reason due to:

   a. Airborne equipment /__/. Identify and describe nature of deficiency.

   b. Ground equipment /__/. Identify and describe nature of deficiency.

   c. Approach control or tower request /__/.

   d. Other /__/. State reason.

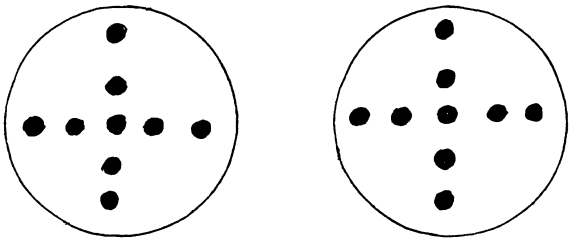
5. Was airplane in trim at 100' for continuation of flare and landings?
   YES /__/ NO /__/

6. If approach and landing abandoned, state altitude above runway:_____ feet, (State reasons)_____
   _____

7. Quality of overall performance: Good /__/ Acceptable /__/ Unacceptable /__/

_____
Pilot in Command's Signature

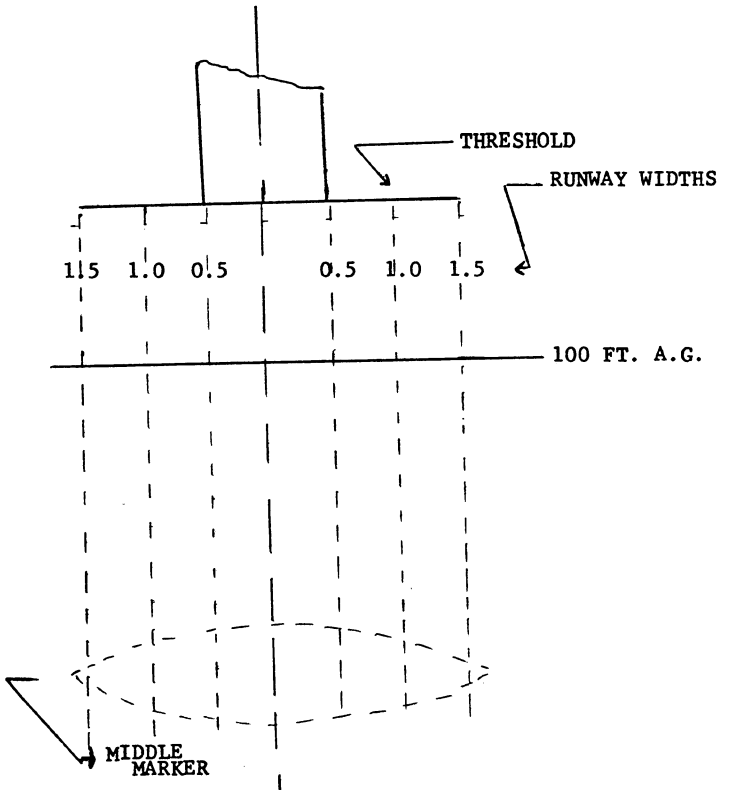
INDICATE GLIDESLOPE AND LOCALIZER DISPLACEMENT AT MIDDLE MARKER AND 100 FT. A.G. POINT.



MIDDLE MARKER

100 FT. A.G.

INDICATE AIRPLANE DISPLACEMENT & ORIENTATION WITH RESPECT TO RUNWAY CENTERLINE AT MIDDLE MARKER AND 100 FT. A.G. BY SYMBOL  AT AIRPORTS AND RUNWAYS LISTED.



TOUCHDOWN WAS _____ FEET FROM THRESHOLD AND

FEET LEFT ☐ RIGHT ☐ OF CENTERLINE

REMARKS:

CATEGORY II PILOT AUTHORIZATION

I UNITED STATES OF AMERICA ***
VIII DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

IV This certifies that

(Name) _____

III while holding pilot certificate

No. _____

IX is authorized to act as pilot in command of the following type aircraft during

II CATEGORY II OPERATIONS

X **Date of issue _____

(Signature) _____
FAA inspector or authorized examiner
Examiner's number _____

(Fold on dotted line)

XII (Airplane types)

_____ *Not valid after (Date)

_____ *Not valid after (Date)

XIII (If applicable) Limited to minimums of 1600' RVR, 150' DH

Expiration date _____

VIII GADO (identification)

VII _____
Signature of the holder

(Cut on dotted line)

* If more than one type is listed, add the date which is the end of the 12th calendar month after the practical test was passed in that type airplane. This will show compliance with FAR 61.10.

** If certificate is reissued to correct or delete a limitation, use the date of issue of the superseded authorization, unless the airman is retested. In the latter case, use the date of retesting, whether for renewal or to add an airplane rating.

*** Use of Roman Numerals is in accordance with ICAO Annex 1, Chapter 5.

Federal Aviation Agency

AC NO: 91-16

CATEGORY II OPERATIONS - GENERAL AVIATION AIRPLANES